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Contents: Process Assessment

Effective Date: **January 2004**

Point of Contact: [Environmental Compliance Representative](#)

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Introduction	
1. Determining Applicability of Industrial Processes	<ul style="list-style-type: none"> • Review inventory of processes that may impact the environment. • Determine if environmental hazards associated were evaluated and documented.
2. Collecting Process Information	<ul style="list-style-type: none"> • Document assessment on Process Assessment Form. • Obtain process-specific information. • Obtain chemical inventory from CMS. • Obtain history of waste generation from Waste Management Database. • Obtain a copy of the Facility Review for the building.
3. Conducting the Process Walkdown	<ul style="list-style-type: none"> • Schedule the process walkdown. • Conduct process walkdown and record specified information.
4. Preparing the Process Flow Diagram	<ul style="list-style-type: none"> • Depict first step of process by rectangle, number it and the following steps, and connect each by an arrow. • List input materials above the process step. • List output wastes, effluents, and emissions below process step. • Denote each solid waste by a square, emission by a triangle, and effluent by a circle. • Number each symbol linking it to the process step.
5. Preparing the Process Assessment Form	<ul style="list-style-type: none"> • Complete Sections I through IV of the Process Assessment Form (PAF)

[Form](#)[6. Compiling and Circulating the Draft Process Assessment](#)[7. Completing the Process Assessment Summary Sheet](#)[8. Preparing the Final Process Assessment](#)[9. Distributing the Final Process Assessment](#)[10. Reviewing and Maintaining Industrial Process Assessments](#)[Definitions](#)**Exhibits**[Process Evaluation Flowchart](#)[Example of the Process Flow Diagram](#)[Summary of Responsibilities](#)**Forms**[Environmental Review of Experiments Form](#)[Environmental Threshold/Priority Determination Form](#)[Process Assessment Form](#)[Process Assessment Summary Sheet](#)[ASSESSMENT FORM \(PAF\)](#)

- Mark the PAF DRAFT and circulate for review.
- Incorporate relevant and appropriate comments.
- Finalize the assessment.
- List the corrective actions required.
- List the pollution prevention opportunities identified.
- List the assessment, prevention, and control measures.
- Compile the assessment documentation.
- Initial and date the Final Process Assessment.
- Assign a file code to the Final Process Assessment.
- Distribute with request for follow-up and notice of change control.
- File Final Process Assessment.
- Conduct and document an annual review of industrial processes.
- Reevaluate significantly modified industrial processes and update the Process Flow Diagram.

Training Requirements and Reporting Obligations

This subject area does not contain training requirements.

This subject area does not contain reporting obligations.

References

[Chemical Management System](#)

[EPA Phase II Process Evaluation Project \(PEP\)](#)

[Identification Of Significant Environmental Aspects And Impacts](#) Subject Area

[Material Safety Data Sheets*](#)

[Pollution Prevention](#) Web site

[Work Planning and Control for Experiments and Operations](#) Subject Area

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Standards of Performance

All staff and guests shall comply with applicable Laboratory policies, standards, and procedures, unless a formal variance is obtained.

Managers shall analyze work for hazards, authorize work to proceed, and ensure that work is performed within established controls.

Managers shall ensure that work is planned to prevent pollution, minimize waste, and conserve resources, and that work is conducted in a cost-effective manner that eliminates or minimizes environmental impact.

All staff and users shall identify, evaluate, and control hazards in order to ensure that work is conducted safely and in a manner that protects the environment and the public.


Management System

This subject area belongs to the **Environmental Management System** management system.

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Introduction: Process Assessment

Effective Date: **January 2004**

Point of Contact: [Environmental Compliance Representative](#)

The purpose of this procedure is to establish the method used to conduct process assessment. For the purposes of this subject area, both experimental research and industrial processes will be referred to as "processes." Processes are those activities and operations at BNL that could be found elsewhere in industry, for example, vehicle maintenance, sewage treatment, utilities and site maintenance, photographic operations, laboratory experiments. At a minimum, industrial processes are those that have been defined as such by the inventory conducted for the EPA Phase II Process Evaluation Project (PEP). "Experimental Research" includes any experiment conducted by BNL staff or non-BNL staff on-site.

The evaluation of processes is documented on the [Process Assessment Form \(PAF\)](#). The PAF consists of a written process description, a detailed process flow diagram, a regulatory determination of all process outputs, identification of pollution prevention (P2) opportunities, and identification of any Assessment, Prevention and Control (APC) measures that should be considered. The [Process Assessment Summary Sheet](#) summarizes the evaluation by a listing of corrective actions, P2 opportunities, and APC measures associated with the process.


See the [Process Evaluation Flowchart](#) for an overview of this subject area.

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1. Determining Applicability of Industrial Processes

Effective: **January 2004**

Point of Contact: [Environmental Compliance Representative](#)

Applicability

This section applies to BNL staff operating industrial processes at BNL.

Required Procedure

This procedure applies to all existing or proposed industrial processes operated under BNL's control.

BNL staff do the following:

Step 1	<p>Review the inventory of processes that may impact the environment. These were prepared in accordance with the requirements of the Identification Of Significant Environmental Aspects And Impacts Subject Area.</p> <p>Note: The exhibit Laboratory Processes that have the Potential to Impact the Environment in the Identification Of Significant Environmental Aspects And Impacts Subject Area lists those processes that have the potential to impact the environment or may have regulated environmental aspects. The list is generic and should be used as a guide to develop a Directorate/Department/Division-specific inventory.</p> <p>Note: Contact your Environmental Compliance Representatives for assistance in compiling and reviewing the inventory.</p>
Step 2	<p>Determine if your process is "Industrial" or "Site Maintenance." Each is subject to this evaluation. See the exhibit Laboratory Processes that have the Potential to Impact the Environment in the Identification Of Significant Environmental Aspects And Impacts Subject Area. It lists Industrial and Site Maintenance Processes.</p>

Step 3	<p>For all other processes, determine if the environmental hazards associated with the processes were evaluated and documented. Acceptable forms of documentation include documents prepared and maintained according to the Work Planning and Control for Experiments and Operations Subject Area.</p> <p>If appropriate documentation is not available, and the process has significant environmental aspects associated with it, then the process is subject to the requirements of this subject area.</p> <p>Note: Large-scale experiments with industrial process attributes may also be assessed using these techniques. The Environmental Threshold/Priority Determination Form may be useful in making this determination. The Environmental Compliance Representative can assist in making this determination.</p>
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References

[Identification Of Significant Environmental Aspects And Impacts](#) Subject Area

[Work Planning and Control for Experiments and Operations](#) Subject Area

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2. Collecting Process Information

Effective Date: **January 2004**

Point of Contact: [Environmental Compliance Representative](#)

Applicability

This information applies to BNL staff and non-BNL staff operating industrial processes.

Required Procedure

This section applies to all existing or proposed industrial processes operated under BNL control.

Step 1	<p>Document the assessment on the Process Assessment Form (PAF) or equivalent.</p> <p>Complete the General Information Section of the PAF; record the following:</p> <ul style="list-style-type: none"> • Department/Division responsible for the process; • Process ID# (obtainable from the Environmental Compliance Representative); • Process Name and Description; • High Priority or Balance; • Department/Division Point of Contact. <p>For details on completing the Process Assessment Form, see the section Preparing the Process Assessment Form.</p> <p>Note: Environmental & Waste Management Services Division maintains a database inventory of all process assessments and assigns a unique ID number to each.</p>
Step 2	<p>Obtain process-specific information. Contact the Department Point of Contact and obtain the name, phone number, and BNL mailing address of the Process</p>

	Point of Contact. Record that information on the Draft PAF.
Step 3	<p>Search the Inventory Reports section of the Chemical Management System. Select the report that focuses best on the process being evaluated, and obtain an inventory of chemicals potentially used in the process. Attach the chemical inventory information to the Draft PAF.</p> <p>Note: In some cases you will have to run an entire building report, and then review it for Process Point of Contact names.</p>
Step 4	<p>Search the Waste Management Program Database to obtain the history of waste generation from the process being evaluated. Contact the Hazardous Waste Program Manager. Request a waste generation report on the building in which the process is located.</p> <p>The report should list hazardous, radioactive, mixed and industrial wastes generated for the past year and include the generator name, waste description, date, and volume. Attach the waste generation report to the Draft PAF.</p>
Step 5	<p>Obtain a copy of the Facility Review for the building in which the process to be evaluated is located. Contact the Facility Review Disposition Project Engineer to obtain a copy of the final report for the building of interest. It is not necessary to attach the Facility Review report to the Draft PAF.</p>

Guidelines

The [Environmental Threshold/Priority Determination Form](#) is a helpful guide in determining whether a process assessment of an experiment is warranted.

References

[Chemical Management System](#)


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3. Conducting the Process Walkdown

Effective: **January 2004**

Point of Contact: [Environmental Compliance Representative](#)

Applicability

This information applies to BNL staff conducting a process walkdown.

Required Procedure

The Process Walkdown is the site visit to physically inspect the process with the Process Point of Contact and obtain the information necessary to prepare the Process Flow Diagram and Process Assessment Form.

Note: Environmental Compliance Representatives (ECRs) are available to assist the line organizations with implementation.

For a list of responsibilities categorized by position, see the exhibit [Summary of Responsibilities](#).

BNL staff do the following:

Step 1	Contact the Process Point of Contact (if an experiment, the contact is the Principal Investigator or designee) and schedule a time to meet at the process location. The Process Point of Contact ensures that other process operators are available to provide information during the walkdown, and brings copies of material specifications, Material Safety Data Sheets (MSDSs), procedures, manuals, engineering drawings, etc. available for review and/or reproduction.
Step 2	<p>Explain the procedure for conducting the process assessment to the Process Point of Contact. Show an example of a completed assessment (available from the Environmental Compliance Representative).</p> <p>It is important that the Process Point of Contact understands the level of detail required to adequately produce the Process Flow Diagram, including identifying all process input materials and output wastes, effluents, and emissions.</p>

<p>Step 3</p>	<p>Starting at the beginning of the process (where materials first enter), begin walking through the steps of the process. To the extent possible, organize the process into a series of logical steps. Record the following information for each step in the process:</p> <ul style="list-style-type: none"> • Detailed description of the equipment and operating conditions (temperature, pressure, flow rate, etc.). Record the title and identifying information for any procedures, manuals, or drawings that describe and/or control the operation and request copies of any considered useful for inclusion as attachments; • Input materials. List trade/product names and review material specifications, procedures for use, and/or the MSDS on materials. Note how materials are used and the flow (estimate) of materials through the process steps. For experimental research requiring many different chemicals, categories may be used (e.g., aromatic hydrocarbons, aliphatic halogenated hydrocarbons); • Outputs, including wastes, effluents, and/or emissions. For each output stream, provide: <ul style="list-style-type: none"> ○ A brief Waste Description; ○ A Determination Basis of how the waste has been characterized. Acceptable bases include chemical/radiological analysis, process knowledge, or the manufacturer's specifications. An example would be "Hazardous Waste (D002), based upon analytical results (see COC #12345)," or "Non-hazardous liquid effluent as determined by Process Knowledge review of MSDS." Obtain copies of any analytical results available; ○ Waste Handling details, including the location of any waste accumulation areas (e.g., satellite areas), the types and sizes of any waste containers stored there, and how the waste is currently disposed. For example, "5-gallon container is accumulated in a satellite area and transferred to Waste Management when full" or "Discharged to the Sanitary System." • List any training related to the environmental aspects of the process that is required for operators; • List the environmental subject areas that are applicable to the process; • List any procedures to be followed or actions to be taken in a process malfunction or an emergency.
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References

[Material Safety Data Sheets](#)*

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4. Preparing the Process Flow Diagram

Effective Date: **January 2004**

Point of Contact: [Environmental Compliance Representative](#)

Applicability

This information applies to BNL staff preparing the process flow diagram for both industrial process and experiments.

Required Procedure

The process flow diagram depicts a process. Using the information collected during the process walkdown, prepare a process flow diagram that depicts the process logically and shows the input materials and output wastes, effluents, and emissions.

Note: Environmental Compliance Representatives (ECRs) are available to assist the line organizations with implementation.

For a list of responsibilities categorized by position, see the [Summary of Responsibilities](#) exhibit.

BNL staff do the following:

Step 1	<p>Prepare the flow diagram using the exhibit Example of the Process Flow Diagram. Use the Microsoft Word draw function to create the drawings. The drawing tool bar has all the required shapes, arrows, and text boxes need to prepare the drawing consistently (go to View-- Toolbars-- Drawing).</p> <p>Show the first step of the process by a rectangle, and number it 1.0. Number additional process steps 2.0, 3.0, etc. and connect each by an arrow.</p>
Step 2	<p>List input materials above the process step where the materials enter the process and depict this by showing arrows going into the top of the rectangle. (Optional: Add regulatory requirements as an input and if color is desired, make the box light blue.)</p>

Step 3	List output wastes, effluents, and emissions below the process step rectangle and show arrows coming out of the bottom, linking the waste to the process step.
Step 4	Denote each waste, effluent, or emission with a symbol, according to the following legend: <ul style="list-style-type: none"> • Solid wastes (all wastes that are collected, including liquids, solids, and gases) are denoted by a square (Optional: If color symbols are desired, use red for RCRA hazardous waste, yellow for PCB waste, magenta for radiological waste, or green for industrial waste. Two color shades indicate a mixture such as magenta/red for mixed waste.); • Air emissions are denoted by a triangle; • Liquid effluents discharged to recharge basins, cesspools, or the sanitary system are denoted by a circle.
Step 5	Number each symbol depicting wastes, effluents, and/or emissions linking it to the process step from which it came; for example, outputs from process step 1.0 would be numbered 1.1, 1.2, 1.3, etc.

Guidelines

Add a box that depicts significant environmental aspects and Pollution Prevention opportunities.


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5. Preparing the Process Assessment Form

Effective Date: **January 2004**

Point of Contact: [Environmental Compliance Representative](#)

Applicability

This information applies to BNL staff preparing the Process Assessment Form for both industrial process and experiments.

Required Procedure

This procedure describes how to complete a Process Assessment Form (PAF). A PAF documents the process assessment and includes the following four sections:

- General Information;
- Detailed Process Descriptions and Waste Determinations;
- Pollution Prevention and Waste Minimization Opportunities;
- Assessment, Prevention, and Control Measures.

Note: Environmental Compliance Representatives (ECRs) are available to assist the line organizations with implementation.

For a list of responsibilities categorized by position, see the exhibit [Summary of Responsibilities](#) exhibit.

BNL staff do the following:

Step 1	<p>Complete Section I of the Process Assessment Form (PAF), General Information. This section includes the</p> <ul style="list-style-type: none"> • Process ID#; • Process name; • Process assessment file name; • Process flow diagram(s) file name(s); • Department/Division; • Dept. code;
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	<ul style="list-style-type: none"> • Dept. code; • Buildings involved; • Rooms involved; • Process point of contact's name and phone; • PAF preparer's name; • Names of those that reviewed the PAF drafts. • Additionally, the General Information section includes a listing of the applicable BNL subject areas. <p>Note: The Process ID# is made up of three elements. The first is the Department/Division code initials, the second is the Process ID number, and the third is a descriptive acronym for the process. An example would be SC-132-MSO, where SC is the organization code for Central Shops Division, 132 is the Process ID Number, and MSO is an acronym for Machine Shop Operations. The Process Assessment filename should be the same as the Process ID, with the ".doc" suffix indicating it is a Microsoft Word document. The Process Flow Diagram's file name(s) should be a continuation of the process ID name, and be numbered sequentially (e.g., diagrams for the above example process would be named SC-132-MSO-01.doc, SC-132-MSO-02, etc.).</p>
Step 2	<p>Complete Section II, Detailed Process Descriptions and Waste Determinations, using the Process Flow Diagram and information collected during the Process Walkdown.</p> <ul style="list-style-type: none"> • Starting with process step 1.0, briefly describe the process. Include descriptions of equipment, operating conditions, materials usage and storage, and waste, effluents, and emissions generated by the process step. Record identifying information (e.g., title, number) of procedures that control the operation, special training related to the environmental aspects of the process, and process-specific actions to be followed in an equipment malfunction or emergency (if any). • Following each process description, complete the table, assign a Waste ID (the number assigned on the Process Flow Diagram) to each output waste, effluent and/or emission from that process step, and provide a Waste Description, Determination Basis, and Waste Handling information. • Document any Corrective Actions that should be taken (e.g., "Sample and analyze sludge for TCLP metals"). Consider all environmental regulatory requirements (federal, state, and local) that could be applicable to each output and to the process in general. • Indicate which BNL subject areas are applicable to the process by checking the appropriate box in the General Information section.
Step 3	<p>Complete Section III: Pollution Prevention and Waste Minimization Opportunities. Evaluate each waste, effluent, and emission to determine if there are opportunities to reduce either the volume or toxicity of the waste stream. Consider substitution of raw materials with less toxic or less hazardous materials, process changes, reuse or recycling of materials and/or wastes, and other initiatives. Document opportunities by completing the table and listing the Process ID#, the waste stream ID# and a description of the pollution prevention opportunity.</p>
Step 4	<p>Complete Section IV: Assessment, Prevention, and Control (APC) Measures.</p>

Identify and fully describe operations, experiments, and waste that have the potential for equipment malfunction, deterioration, or operator error, and discharges or emissions that may cause or lead to releases of hazardous waste or pollutants to the environment or that potentially pose a threat to human health or the environment. Assess these operations to determine

- If engineering controls are needed to control hazards;
- Where documented standard operating procedures need to be developed;
- Where routine, objective, self-inspections by department supervision and trained staff need to be conducted and documented;
- Where any other vulnerability needs to be further evaluated.

Document the assessment on the table in this section, listing the Process ID#, Waste Stream ID#, and a description of the APC measure.


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6. Compiling and Circulating the Draft Process Assessment

Effective Date: **January 2004**

Point of Contact: [Environmental Compliance Representative](#)

Applicability

This information applies to BNL staff compiling and circulating the Draft Process Assessment for both industrial process and experiments.

Required Procedure

The Draft Process Assessment, consisting of the Process Assessment Form, Process Flow Diagram, and any relevant exhibits, must be circulated for review and comment to the Line Organization, and the Environmental and Waste Management Services Division subject matter experts.

Note: Environmental Compliance Representatives (ECRs) are available to assist the line organizations with implementation.

For a list of responsibilities categorized by position, see the exhibit [Summary of Responsibilities](#).

BNL staff do the following:

Step 1	<p>Attach the Process Assessment Form (PAF), Process Flow Diagram and any attachments, mark "DRAFT," and prepare a memorandum for transmittal of the assessment. The memorandum should establish a response deadline and request the recipient to mark comments directly on the draft document and return. Send copies as follows:</p> <ul style="list-style-type: none">• One copy to the Process Point of Contact/Principal Investigator for review and factual accuracy.• One copy to the Department/Division Point of Contact for review and factual accuracy.
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	<ul style="list-style-type: none">• One copy to the Facility Support Representative for review and factual accuracy.• Three copies to the Environmental Services and Waste Management Division Technical Support staff (subject matter experts) for review, and factual accuracy.• One copy to the Environmental Compliance Representative assigned to support that Department/Division for review and comment.
Step 2	The preparer confers with the reviewers to obtain clarification of any comments not clearly understood. Upon receipt and resolution of all comments, the preparer finalizes the Draft Process Assessment by incorporating factual accuracy comments and other relevant comments.
Step 3	Enter the names of all reviewers and the date reviewed on the General Information Section of the PAF.


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7. Completing the Process Assessment Summary Sheet

Effective Date: **January 2004**

Point of Contact: [Environmental Compliance Representative](#)

Applicability

This information applies to BNL staff completing the Process Assessment Summary Sheet for both industrial processes and experiments.

Required Procedure

This section describes how to complete the Process Assessment Summary Sheet. The Sheet summarizes the Corrective Actions listed in Section II, the Pollution Prevention Opportunities listed in Section III, and the Assessment, Prevention, and Control measures listed in Section IV of the Process Assessment Form (PAF).

Note: Environmental Compliance Representatives (ECRs) are available to assist the line organizations with implementation.

For a list of responsibilities categorized by position, see the exhibit [Summary of Responsibilities](#).

BNL staff do the following:

Step 1	List the Corrective Actions required on the Process Assessment Summary Sheet . Departments/Divisions are required to implement the corrective actions noted in this section.
Step 2	List the pollution prevention (P2) opportunities identified. The Department/Division evaluates the P2 opportunities for technical and economic feasibility.
Step 3	List the Assessment Prevention and Control (APC) measures that must be evaluated by the Department/Division. The Department/Division submits a

	written response for APC measures.
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Guidelines

Departments may contact the Pollution Prevention (P2) Program to apply for money for implement pollution prevention suggestions. Visit the [Pollution Prevention Web site](#).

References

[Pollution Prevention Web site](#)


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8. Preparing the Final Process Assessment

Effective Date: **January 2004**

Point of Contact: [Environmental Compliance Representative](#)

Applicability

This information applies to BNL staff preparing the final process assessment for both industrial processes and experiments.

Required Procedure

Note: Environmental Compliance Representatives (ECRs) are available to assist the line organizations with implementation.

For a list of responsibilities categorized by position, see exhibit the [Summary of Responsibilities](#).

BNL staff do the following:

Step 1	Review the Final Process Assessment for the following necessary items: <ul style="list-style-type: none">• The Process Assessment Summary Sheet;• The Process Assessment Form;• The Process Flow Diagram;• Any other relevant documents (e.g., copies of the Environmental Threshold/Priority Determination Form if applicable, analytical reports, Material Safety Data Sheets (MSDSs), drawings).
Step 1	The preparer initials and dates the Final Process Assessment in the "Prepared By" box on the Process Assessment Form (PAF).

References

[Material Safety Data Sheets*](#)

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9. Distributing the Final Process Assessment

Effective Date: **January 2004**

Point of Contact: [Environmental Compliance Representative](#)

Applicability

This information applies to BNL staff distributing the Final Process Assessment for both industrial process and experiments.

Required Procedure

Environmental Compliance Representatives (ECRs) are largely responsible for implementing this procedure, with assistance from other staff.

For a list of responsibilities categorized by position, see the exhibit [Summary of Responsibilities](#).

Step 1	The Environmental Compliance Representative assigns a file code to the Final Process Assessment (PA).
Step 2	Transmit a copy of the Final Process Assessment to the Department Point of Contact/Principal Investigator, with a request for follow-up and notice of change control.
Step 3	Place a copy of the Final Process Assessment in the Environmental and Waste Management Services Division's PA file. The file name should be the PA ID number.

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10. Reviewing and Maintaining Industrial Process Assessments

Effective Date: **January 2004**

Point of Contact: [Environmental Compliance Representative](#)

Applicability

This information applies to BNL staff reviewing and maintaining industrial process assessments only.

Required Procedure

Step 1	The Department/Division conducts an annual review to ensure that the design and operation of long-term industrial processes have not changed and that they conform with DOE Orders, federal and state regulations, BNL environmental subject areas, and other pertinent requirements. This annual review must be documented. A process walkdown must be conducted every three years.
Step 2	Reevaluate industrial processes that have been significantly modified, and update the Process Flow Diagram (see the section Preparing the Process Flow Diagram).


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Definitions: Process Assessment

Effective Date: **January 2004**

Point of Contact: [Environmental Compliance Representative](#)

Term	Definition
Assessment, Prevention and Control Measures (APC)	Measures such as standard operating procedures that are implemented to control processes and waste streams where equipment malfunctions, equipment deterioration, operator errors, discharges, or emissions may potentially cause or lead to releases of hazardous materials or pose a threat to human health or the environment.
Chemical Management System (CMS)	A dynamic, electronic inventory tracking system that provides site-specific location of chemicals at BNL.
Department Point of Contact	The individual appointed by each Department or Division to act as the primary liaison for the Process Evaluation Project (PEP). These contacts are listed in the PEP Inventory.
experimental research	Processes and preparations necessary to conduct tests or investigations of phenomena utilizing equipment, materials or energy.
facility review	A compilation of reports completed in 1998 that documents environmental issues related to each building on-site.
industrial process	Any operation or process at BNL that could be found elsewhere in industry, for example vehicle maintenance, sewage treatment, utilities and site maintenance, photographic operations, etc. At a minimum, industrial processes are those defined by the inventory conducted for the EPA Phase II Process Evaluation Project (PEP).
pollution prevention opportunities (P2)	P2 opportunities are source reduction, process changes, reusing, recycling, and/or other ideas that have the effect of reducing or eliminating waste.
Process Evaluation Project (PEP) Inventory	The list of industrial processes and experiments that are subject to evaluation under the Memorandum of Agreement (MOA) between DOE and EPA and make up the scope of work for the PEP.

process	For the purposes of this subject area, a process includes both industrial processes and experimental research.
Process Assessment Form (PAF)	The form that documents the process assessment. The PAF includes the process identification number, description, regulatory determination of outputs, P2 opportunities, APC measures, process flow diagram, and corrective actions.
Process Flow Diagram	Depicts a process logically and graphically, identifying process input materials and output waste streams on a multimedia basis (air, liquid, solid).
process point of contact	The person in the BNL Department/Division that is responsible for the process and is the person that will walkdown the process with the Environmental Compliance Representative (ECR). Ideally, the Process Point of Contact is the operator of the process and has access to information on materials and operations involved in the process. In the case of experimental research, this person may be the Principal Investigator.
process walkdown	The act of physically going to the process location with the responsible person and observing and documenting the process components, operations, materials, and waste streams. During the process walkdown, information is collected to develop the Process Flow Diagram and the Process Assessment Form (PAF).

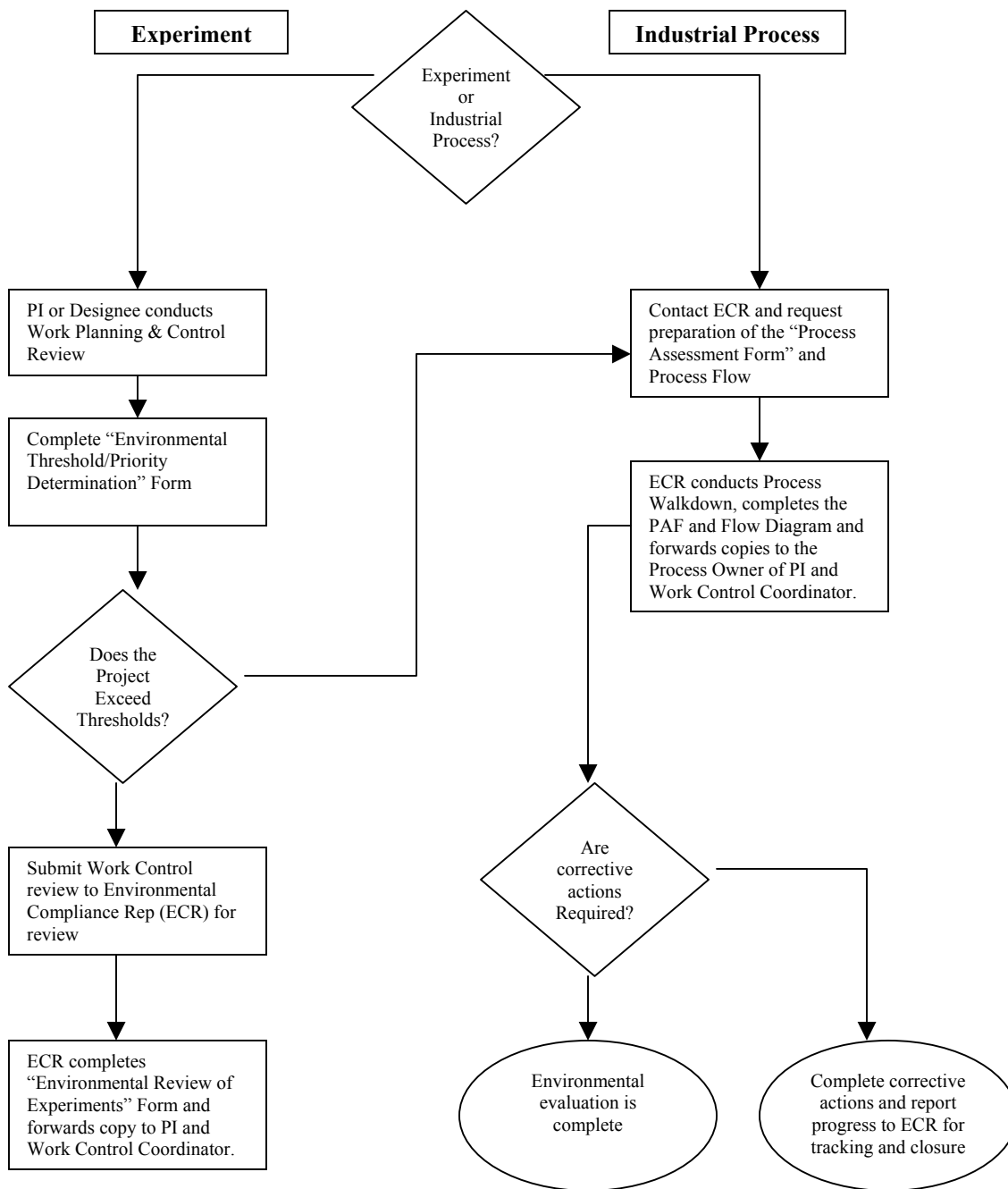
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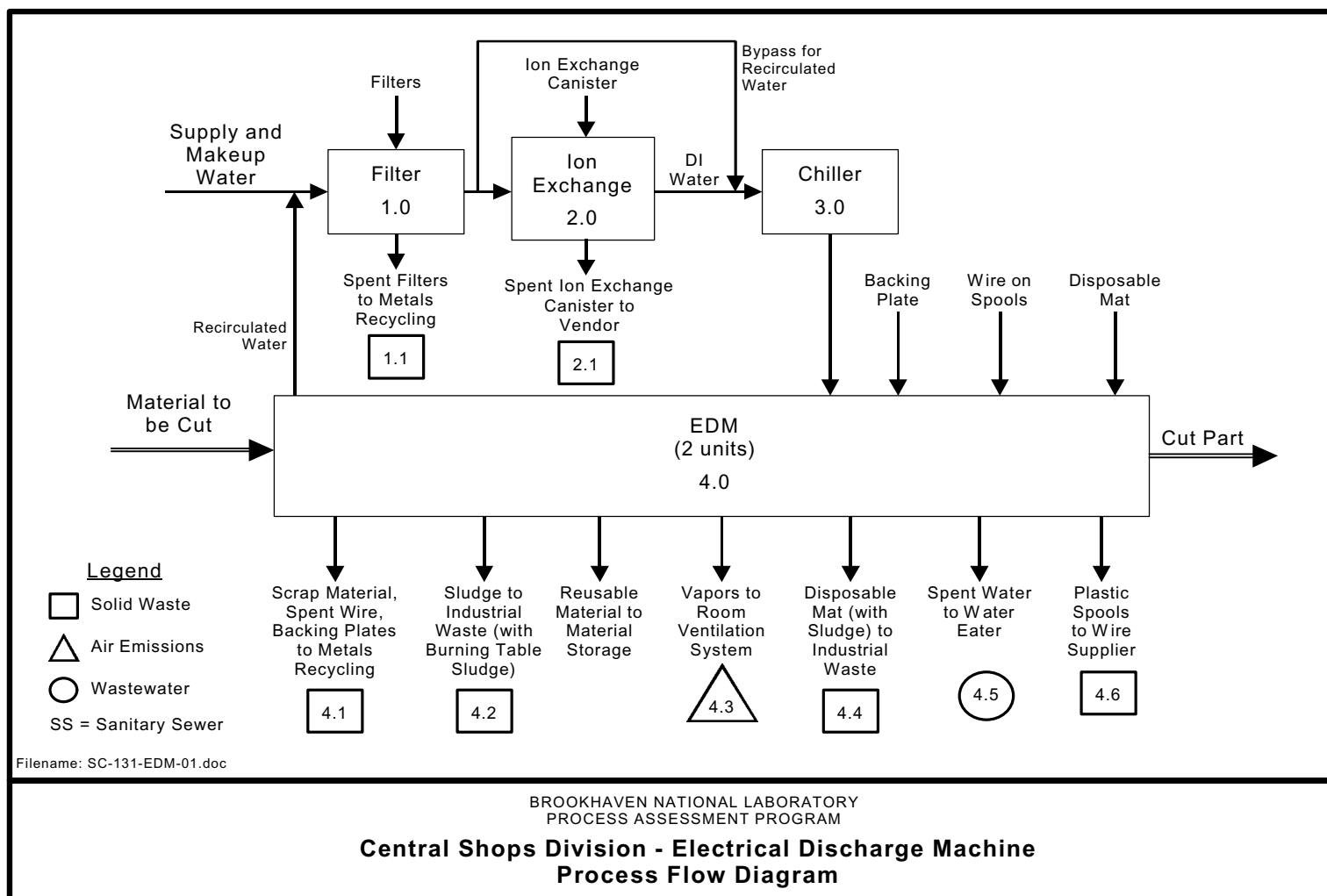
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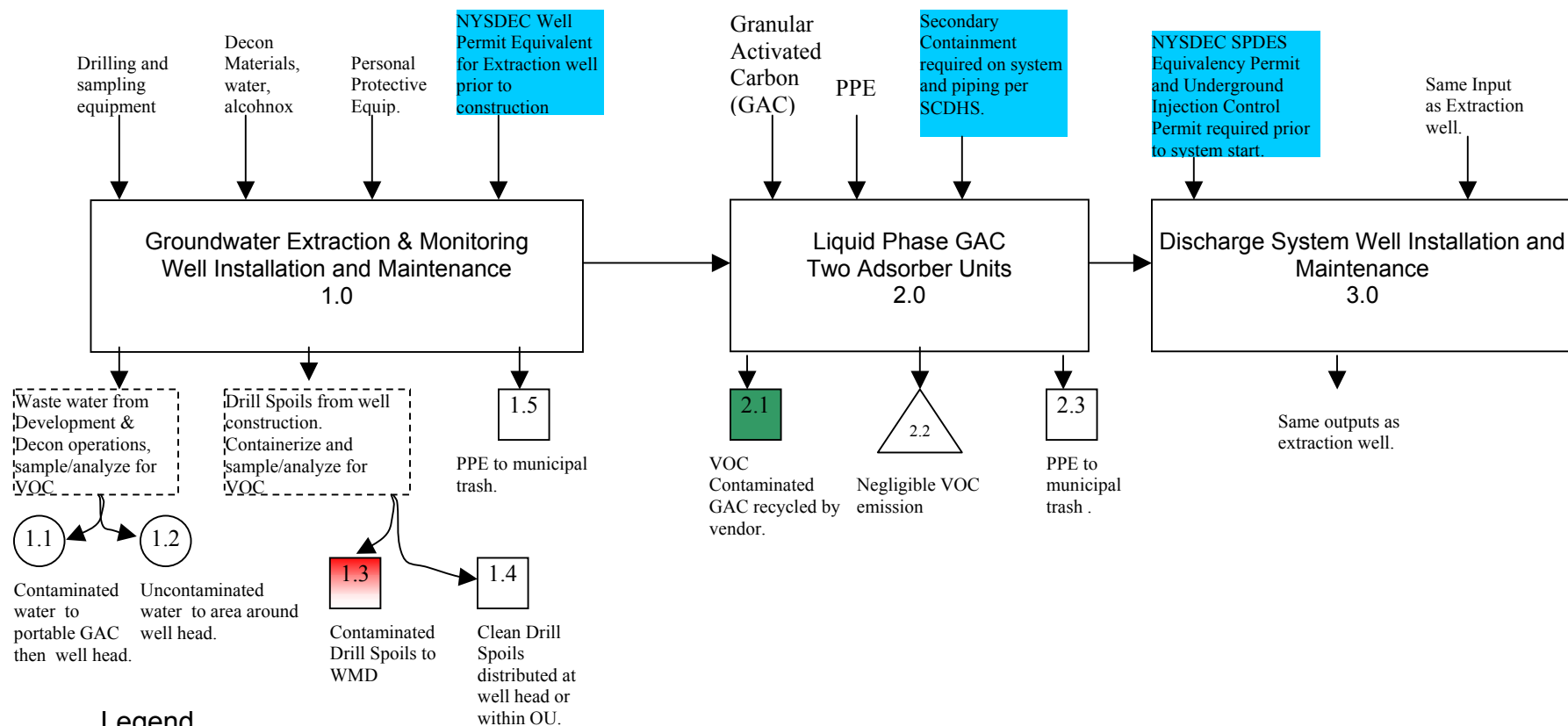
Process Evaluation Flowchart



Example of Process Flow Diagram




Example of Process Flow Diagram with Optional Color



Filename: ERD-OUIII LIPA-EM.doc

BROOKHAVEN NATIONAL LABORATORY: PROCESS MAP

OUIII LIPA Offsite Groundwater Treatment System Environmental Process Assessment



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Subject Area: **Process Assessment**

Summary of Responsibilities

Effective Date: **January 2004**

Point of Contact: [Environmental Compliance Representative](#)

Environmental Compliance Representatives (ECRs) are available to assist the line organizations with implementation.

The preparer must

- Evaluate BNL processes in accordance with this procedure.
- Communicate progress, issues, and problems.
- Circulate draft process assessments to the Environmental Services and Waste Management Division Technical Support subject matter experts and Department/Division points of contact for review and comment.
- Resolve comments, incorporate valid comments, and finalize the process assessments.
- Maintain accurate records to document the assessment and ensure the information is retrievable.
- Obtain training in this procedure.
- Observe all posting and work requirements in place during process walkdowns.

The Environmental Services and Waste Management Division Manager must

- Provide strategic and tactical input into the overall process of conducting environmental assessment of processes.
- Provide high quality technical support staff to line organizations to complete the environmental assessment of processes.
- Resolve issues that require agreement between Department/Division management and the Environmental Services and Waste Management Division.

The Environmental Compliance Representative Manager (or Project Manager) must

- Assign qualified, trained, motivated staff to serve line organizations in performance of environmental assessment of processes.
- Designate areas of responsibility (Departments/Divisions) for ECRs and assign responsibility for conducting process evaluations on schedule.
- Review environmental assessments of processes for quality and completeness.
- Assist in the development/use of management systems to track assessment data and ensure corrective actions.
- Communicate the results of process assessments.

Environmental Services and Waste Management Division Technical Support Staff must

- Review process assessments for completeness, accuracy and quality.
- Validate the regulatory determination of process outputs and provide written comments, as needed.
- Provide supporting data, documentation, and information to the ECR conducting the assessment.
- Identify pollution prevention opportunities or Assessment, Prevention and Control (APC) measures that should be considered for incorporation in the assessment.

Principal Investigators must

- Apply the thresholds to their experiments and notify the ECR if the thresholds are exceeded.
- Provide information to ECRs and tour the experimental apparatus to assist the ECR with the process walkdown.
- Implement corrective actions identified by the ECR.

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EPA Phase II: Process Evaluation Project (PEP)
Environmental Review of Experiments

General Information:

PEP ID#		Department	
Project Name			
Principal Investigator		Phone	
Point of Contact		Phone	
Exceed Threshold	No Yes, why?		

<u>Materials of Concern:</u>	Radioactive	Carcinogens	Heavy Metals	Solvents
Biological				
<u>Air Issues:</u>	Point Source	Fugitive	VOC	Particulate
Radioactive				
<u>Effluent Issues:</u>	Sanitary	Storm	Cesspool	Sink Discharges
Radioactive				
<u>Waste Issues:</u>	Radioactive	Hazardous	Mixed	Industrial
SAA				
<u>Toxic/Hazardous Materials Storage Issues:</u>	Article 12	Tanks	Portable Containers >250 gal	
<u>Corrective Actions:</u> None				
<u>Pollution Prevention Opportunities:</u> None				
<u>Assessment, Prevention, or Control Measures:</u> None				
Reviewed By:			Date:	
Signature:	_____		_____	

ENVIRONMENTAL THRESHOLD/PRIORITY DETERMINATION

Answer the following questions regarding the proposed experimental activity:

EPA Threshold Determination Criteria	Yes	No
Does the experimental process result in the generation of hazardous, mixed, or radioactive waste in excess of 1000 cc's per run* ?		
Does the experimental process require a point source air permit ?		
Does the experimental process involve the use of ammonia, or ammonia compounds, in excess of 50 grams of ammonia per run?		
Does the experimental process involve the use of copper, or copper compounds, in excess of 4 grams of copper per run?		
Does the experimental process involve the use of silver, or silver compounds, in excess of 0.4 grams of silver per run?		
Does the experimental process involve the use of zinc, or zinc compounds, in excess of 2.7 grams of zinc per run?		
Does the experimental process involve the use of mercury, or mercury compounds, in excess of 5 milligrams of mercury per run?		
Does the experimental process involve the use of PCBs in any quantity ?		
Does the experimental process involve the use of pesticides in any quantity ?		
Does the experimental process involve the use of more than 0.5 mCi of tritium per run?		
Does the experimental process involve the use of more than 0.07 mCi of C-14 per run?		
Does the experimental process involve the use of more than 0.02 mCi of P-32 per run?		
Does the experimental process involve the use of more than 0.3 mCi of S-35 per run?		
Does the experimental process involve the use of any other radioactive isotopes? List isotope and activity used per run.		

EPA Priority Determination	Yes	No
Will the experimental process utilize any acutely toxic materials, as identified in ESH Standard 6.2.0, Appendix 2 (G)(1)?		
Will the experimental process utilize any of the following compounds, in any amount?		
Mercury		
1,1,1-Trichloroethane		
Trichloroethylene		
Perchloroethylene		
Carbon Tetrachloride		
Polychlorinated Biphenyls (PCBs)		
Ethylenedibromide		
Pesticides		
Strontium-90		
Tritium		

* "Per Run" means each time the experiment is run

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Subject Area: **Process Assessment**

Process Assessment Form

Effective Date: **January 2004**

Point of Contact: [Environmental Compliance Representative](#)

The Process Assessment Form is provided as a [Word](#) file. Below is an example of Sections I and II of the form. Sections III and IV are provided on the word document to list "Waste Minimization and Opportunities for Pollution Prevention" and "Assessment, Prevention and Control" measures.

Section I: General Information

EXAMPLE BROOKHAVEN NATIONAL LABORATORY PROCESS ASSESSMENT FORM	
I. General Information	
Process ID:	SC-131-EDM
Process Name:	Electrical Discharge Machine
Process Flow Diagram:	SC-131-EDM-01 to 04
Process Description:	This process includes the two Electrical Discharge Machines (EDMs) located in Building 479 and managed by the Central Shops Division at BNL. The EDMs are utilized to cut conductive metal parts into various shapes that would be difficult to achieve using traditional metal cutting machines. During cutting, the area of the part to be cut is submerged in deionized water. A high voltage electrical current is applied to a brass wire and arcs through the deionized water to the conductive metal part being cut. At the point where the electrical arc contacts and penetrates the part, metal is vaporized and reduced to a sludge. Water for each EDM is supplied by a dedicated deionized water system, which includes a particulate filter, ion exchange canister and chiller. Brass wire on a spool is loaded into

	the EDM, utilized to carry the electrical current and then collected for metals recycling. Section II and the above referenced Process Flow Diagram provides more detail on the Electrical Discharge Machine operations.			
Dept/Div:	Central Shops Division			
Dept Code:	SC			
Buildings:	479			
Room(s):	N/A			
Point of Contact:	T. Lambertson	x3352		
Prepared by:	D&B, G. Goode	Reviewed by:	T. Lambertson, B. Lee, J. Williams, G. Goode	

Section II: Detailed Process Descriptions and Waste Determination

II. Detailed Process Descriptions and Waste Determination

[Provide a detailed description of the entire process in this section, for example&]

The operation of the two Electrical Discharge Machines (EDMs) located in Building 479 and managed by the BNL Central Shops Division has been organized into four components, identified as 1.0 through 4.0. These four components include the particulate filter, ion exchange canister and chiller, which are associated with the deionized water system, and the EDM. Process Flow Diagram CSD-131-EDM-01 to 04, provided in Exhibit 1, graphically depicts the inputs and outputs for these four components.

BNL operates two EDMs, which are located within Building 479 in an isolated room with a dedicated ventilation system. The air within the EDM room is changed 11 times per minute to prevent the build up of hazardous vapors during operation of the EDM. The room air is discharged directly to the outside air by the air handling system&(continues).

[Then, referring to the flow diagram, briefly describe each process step and document the regulatory determination of process outputs in the table shown&]

Regulatory Determination of Process Outputs

1.0 Particulate Filter

The metal screened, paper lined filter is primarily utilized to remove particulate from the recirculated deionized water that was generated during cutting. Particulate filters are typically changed once a month, depending on the number of metal parts cut. Approximately once a month, the entire spent filter, metal and paper both, is removed and deposited in the metals recycling bin. From the particulate filter, supply and makeup water flows to the ion exchange canister (2.0). Recirculated water, however, may bypass the ion exchange canister (2.0) and enter the chiller (3.0) if the measured resistivity is low.

Waste ID	Waste Description	Determination/Basis	Waste Handling	Corrective Action Required
1.1	Spent metal screened, paper lined particulate filter	Non-hazardous solid waste as determined by process knowledge	Filter placed in chip bin and sent off-site for metals recycling	Collect sample of paper liner and analyze for chromium (from stainless steel) to verify nonhazardous

2.0 Ion Exchange Canister

The ion exchange canister is primarily utilized to deionize the supply and make-up water. Recirculated water may bypass the ion exchange canister if the measured resistivity is low. A vendor supplies ion exchange canisters. Approximately 2 to 3 times a year the ion exchange canister is replaced and the spent ion exchange canister is returned to the vendor for regeneration. From the ion exchange canister, water flows to a chiller (3.0).

Waste ID	Waste Description	Determination/Basis	Waste Handling	Corrective Action Required
2.1	Spent ion exchange canister	Non-hazardous solid waste as determined by process knowledge	Spent ion exchange canister returned to the vendor for regeneration	None

3.0 Chiller

Water utilized in the EDM is heated during cutting. As a result, the chiller is utilized to cool the recirculated water back to room temperature prior to being returned to the EDM (4.0).

The chiller does not utilize any coolants and no wastes are generated by this operation.

4.0 EDM

The EDM utilizes a high voltage electrical arc to cut conductive metals such as aluminum, brass, carbon steel, copper and stainless steel. Brass wire on a spool is loaded into the EDM, unrolled from the spool during cutting and positioned close to, but not touching, the conductive metal part to be cut. The gap between the brass wire and the part is filled with deionized water that is supplied by a dedicated deionized water system (1.0, 2.0 and 3.0). A high voltage electrical current is applied to the wire and arcs through the water to the conductive metal part. At the point where the electrical arc contacts and penetrates the metal part, the metal is vaporized and disintegrated into fine particles. These fine particles

metal part, the metal is vaporized and disintegrated into fine particles. These fine particles of metal form a sludge which becomes trapped in the plastic grass mat that lines the EDM water reservoir, adheres to the EDM cutting tray or becomes entrained in the deionized water. The plastic mat lasts a considerable amount of time and is rarely discarded. Sludge adhered to the cutting area and water reservoir of the EDM is manually scraped from the surface and disposed of with the sludge from the Anderson Water Table (burning table). And lastly, sludge in the deionized water is filtered by the metal screened, paper lined filter (1.0) and ultimately deposited in the metals recycling bin with the spent filter. Scrap metal parts, backing plates and spent wire are recycled. Fumes from the process are vented to the outside air. Empty plastic spools from the brass wire are returned to the vendor for reuse or recycling.

The deionized water is emptied approximately 3 to 4 times a year depending on the workload. At that time, water is pumped from the EDM into a drum and transferred to the Water Eater evaporator in Building 495. The sludge buildup on the cutting area and water reservoir is also removed at this time.

Waste ID	Waste Description	Determination/Basis	Waste Handling	Corrective Action Required
4.1	Scrap metal, spent wire and backing plates	Nonhazardous recyclable metals	Metals placed in chip bins and sent off-site for recycling	None
4.2	Metal sludge	Nonhazardous solid waste as determined by process knowledge	Waste combined with Anderson Water Table waste and then transferred to the HWMF for off-site disposal	Collect sample and analyze for chromium to verify nonhazardous
4.3	Fumes and water vapor	Nonhazardous vapors as determined by process knowledge	Vapors vented to outside air	Obtain indoor air monitoring data for EDM room
4.4	Plastic mat coated with metal sludge	Nonhazardous solid waste as determined by process knowledge	Waste should be disposed of as industrial waste	Collect sample and analyze for chromium to verify nonhazardous

4.5	Spent EDM water	Nonhazardous wastewater as determined by process knowledge	Wastewater transferred to the Water Eater evaporator	None
4.6	Empty plastic spools from brass wire	Nonhazardous recyclable material	Plastic spools returned to the vendor for reuse or recycling	None

Section III: Pollution Prevention & Waste Minimization Opportunities III.

III. Pollution Prevention and Waste Minimization Opportunities

1.0 Particulate Filter

The particulate filter is a metal screened, paper lined cylindrical filter. The filter paper removes the fine particles of metal generated by the cutting of the metal parts that become entrained in the deionized water. The filters are replaced approximately once a month and the spent filters deposited in the chip bins for metals recycling. A potential pollution prevention alternative would be to replace the current disposable filters with permanent filters that only require the periodic replacement of the filter paper. The spent filter paper would most likely be disposed of as industrial waste depending on analytical testing results. The metal-screened portion of the filters does not deteriorate or become clogged therefore it should not be necessary to replace the entire filter. Implementing this alternative would reduce the volume of waste by only disposing of the paper filter. In addition, the cost of new filters should decrease.

III. Pollution Prevention and Waste Minimization Opportunities 1.0 Particulate Filter The particulate filter is a metal screened, paper lined cylindrical filter. The filter paper removes the fine particles of metal generated by the cutting of the metal parts that become entrained in the deionized water. The filters are replaced approximately once a month and the spent filters deposited in the chip bins for metals recycling. A potential pollution prevention alternative would be to replace the current disposable filters with permanent filters that only require the periodic replacement of the filter paper. The spent filter paper would most likely be disposed of as industrial waste depending on analytical testing results. The metal-screened portion of the filters does not deteriorate or become clogged therefore it should not be necessary to replace the entire filter. Implementing this alternative would reduce the volume of waste by only disposing of the paper filter. In addition, the cost of new filters should decrease.

Summary of Pollution Prevention Opportunities		
Process ID	Waste Stream ID	Potential Pollution Prevention Measures
1.0	Spent filter to chip bins for metals recycling	Replace disposable filter with a permanent filter which only requires the periodic

		replacement of the filter paper
--	--	------------------------------------

4.0 EDM

Approximately 3 to 4 times a year, the water is drained from the EDM and the sludge is scraped from the cutting area and water reservoir. The spent water is pumped into a drum and transferred to the Water Eater evaporator in Building 495. A potential pollution prevention alternative would be to reuse the removed water rather than transferring the water to the Water Eater Evaporator.

Prior to shutdown, the water could be collected from the system subsequent to exiting the filter. In this manner, it is ensured that no sludge is collected with the water. The water would be placed in a dedicated container that has been thoroughly rinsed with deionized water prior to initial use.

When maintenance is complete, the water would be returned to the water reservoir in the EDM. Prior to use, the water would be circulated through the filters, ion exchange canister and chiller to ensure quality and temperature.

Implementing this alternative would eliminate the handling of the spent water as a waste including the transfer of the wastewater to the Water Eater evaporator. In addition, the need to deionize new supply would be eliminated which would prolong the useful life of the ion exchange canister.

Summary of Pollution Prevention Opportunities		
Process ID	Waste Stream ID	Potential Pollution Prevention Measures
1.0	Spent water to Water Eater evaporator	Containerize EDM water during maintenance operations for reuse rather than discarding

Section IV: Assessment, Prevention, and Control Measures

IV. Assessment, Prevention and Control

1.0 Particulate Filter

The particulate filter is utilized to filter fine metal particles from the recirculated water. There is the potential for the fine particles to contain a high concentration of chromium if large volumes of stainless steel parts are cut. Accordingly the filter paper may also contain a high concentration of chromium. A log of the types of metal parts cut should be maintained and analytical testing performed to ensure that the filter paper is managed appropriately. A high volume of stainless steel parts may result in the filter paper being classified as hazardous waste.

Summary of Pollution Prevention Opportunities		
Process ID	Waste Stream ID	SOP, Inspection, or other APC Measures Recommended
1.0	1.1	Maintain log of types and quantities of materials cut on EDM to ensure proper disposal of filters.

4.0 EDM

The EDM utilizes water for its operation. This water is stored in a reservoir within the EDM. If this reservoir were to fail, the water, along with any sludge, would be released to the room. It is therefore recommended that the EDM be placed within a spill pan or bermed area to ensure the containment of any spills that may occur during operation or maintenance.

Sludge generated from the cutting of stainless steel parts may contain a high concentration of chromium if large volumes of stainless steel parts are cut. It is recommended that a log be maintained of the types of metal parts cut and analytical testing be performed to ensure that the sludge is managed appropriately. A high volume of stainless steel parts may result in the sludge being classified as hazardous waste.

Prevention Assessment and Control Initiatives		
Process ID	Waste Stream ID	SOP, Inspection, or other APC Measures Recommended
4.0	4.2 & 4.4	Evaluate feasibility of placing EDM reservoir in secondary containment to contain potential release of water and metal sludges.
4.0	4.5	Maintain log of types and quantities of materials cut on EDM to ensure proper disposal of sludge.

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**BROOKHAVEN NATIONAL LABORATORY
PROCESS ASSESSMENT FORM**

I. General Information

Process ID:	XXX-XXX-XXX	PEP ID #XXX	
Process Name:			
Process Flow Diagrams:	(Provide hyperlink)		
Process Description:			
Dept/Div:			
Dept Code:			
Buildings:			
Room(s):			
Points of Contact:		Extension:	
		Extension:	
Prepared by:		Reviewed by:	
Revised by:	J. Selva	Reviewed by:	
Approved by:	M. Clancy		Date:

II. Detailed Process Descriptions and Waste Determinations

Process Descriptions:

Regulatory Determination of Process Outputs

1.0

Waste ID	Waste Description	Determination/ Basis	Waste Handling	Corrective Action Required
○				
□				

III. Waste Minimization and Opportunities for Pollution Prevention

Summary of Pollution Prevention Opportunities		
Process ID	Waste Stream ID	Potential Pollution Prevention Measures

IV. Assessment, Prevention and Control

Assessment Prevention and Control Initiatives		
Process ID	Waste Stream ID	SOP, Inspection , or other APC Measures Recommended

PROCESS ASSESSMENT SUMMARY SHEET

This sheet summarizes the results of the Process Assessments conducted on the process identified below. The evaluation was conducted, as required by EPA/DOE Memorandum of Agreement, to ensure all wastes, effluents, and emissions generated at Brookhaven National Laboratory are managed in accordance with applicable regulations. Listed below are issues that were identified during the assessment. Some issues require action on the part of the Department/Division.

General Information:

Department/Division:					
Process Name:				Process ID:	
Point of Contact:				Phone:	
# Corrective Actions:		# P2 Opportunities:		# APC Measures:	

Section I: Corrective Actions Related to Wastes, Effluents, or Emissions (Required)

This section lists any required actions that must be undertaken by the Department/Division to ensure the particular waste, effluent, or emission is being managed in accordance with applicable regulatory requirements.

Process Step	Waste ID #	Waste Description	Corrective Action Required

Section II: Waste Minimization and Pollution Prevention Opportunities

Options identified in this section should be evaluated by the Department/Division to determine the technical and economic feasibility of implementation. The Department/Division may request funding for feasible options from the BNL Pollution Prevention Program.

Process Step	Waste ID #	Waste Description	P2 Opportunity

Section III: Assessment, Prevention, or Control Measures (Written Response Required)

The Department/Division must evaluate APC measures identified in this section and a written response must be submitted to the Environmental Services Division. The response may include action plans and schedules or the Department's assessment that determines that no action is necessary.

Process Step	Waste ID #	SOP, Inspection, or other APC Measures Recommended

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Revision History: Process Assessment

Point of Contact: [Environmental Compliance Representative](#)

Revision History of this Subject Area

Date	Description	Management System
January 2004	<p>The following revisions were made to this subject area:</p> <ul style="list-style-type: none">• The title of the subject area was changed from "Environmental Evaluation of Industrial Processes and Experimental Research" to "Process Assessment" to be more consistent with operations. Points of contact were also changed to be consistent with operations.• The title of section 1 was changed from Reviewing Experimental Research to Determining Applicability of Industrial Processes. The section was revised to clearly describe the laboratory processes that have the potential to impact the environment. It was also revised to allow the work planning process to be an alternative to the process assessment for experimental reviews, if properly documented.• The Process Assessment Form was added as a Word file.• The section Reviewing and Maintaining Industrial Process Assessments was revised to allow an annual review and 3-year walkdown.• The 1.3.5 Review Form and the 1.3.5 Review Hazard Identification Checklist were deleted to be consistent with the current work planning process	Environmental Management System

	current work planning process.	
February 2000	This subject area was revised to address a recommendation from the RHIC ISO 14000 registration audit. The change requires an annual review of industrial process evaluations to maintain them current and also requires a re-evaluation of industrial processes that have been significantly modified. The review requirement parallels the requirement for the annual review of experiments.	Environmental Management System
March 1999	Departments have been meeting the requirements of this subject area by implementing the EPA Phase II Process Evaluation Project.	Environmental Management System

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